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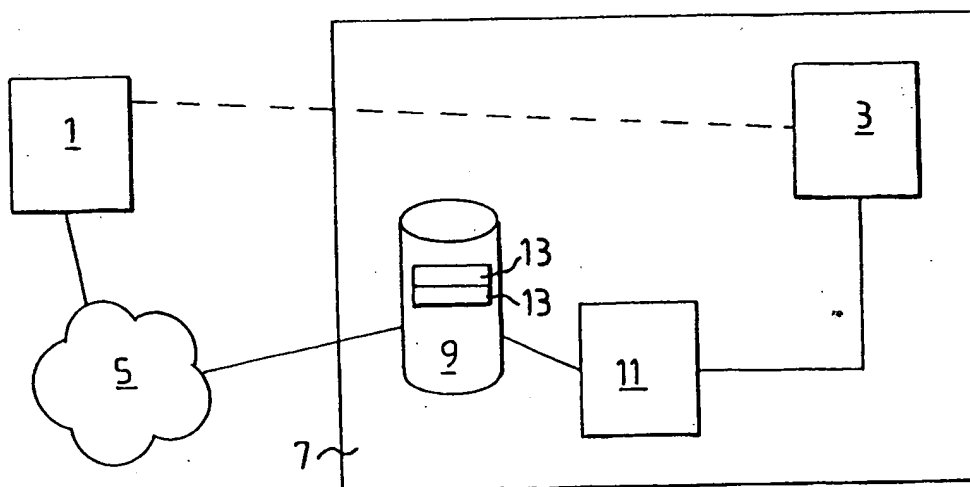
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ADDRESS OF A SECOND SUBSCRIBER IN A VIRTUAL PRIVATE NETWORK

(57) Abstract

The present invention relates to an apparatus and a method for use in a virtual private network, VPN, (7, 7'), or a network domain forming part of a larger network, such as the Internet, to enable a first subscriber (1; 1') in the larger network to retrieve the address of a second subscriber (3; 3') in the VPN. The address may be returned to the first subscriber (1; 1') or a connection means (11) may set up the connection between the subscribers (1, 3; 1', 3') automatically.

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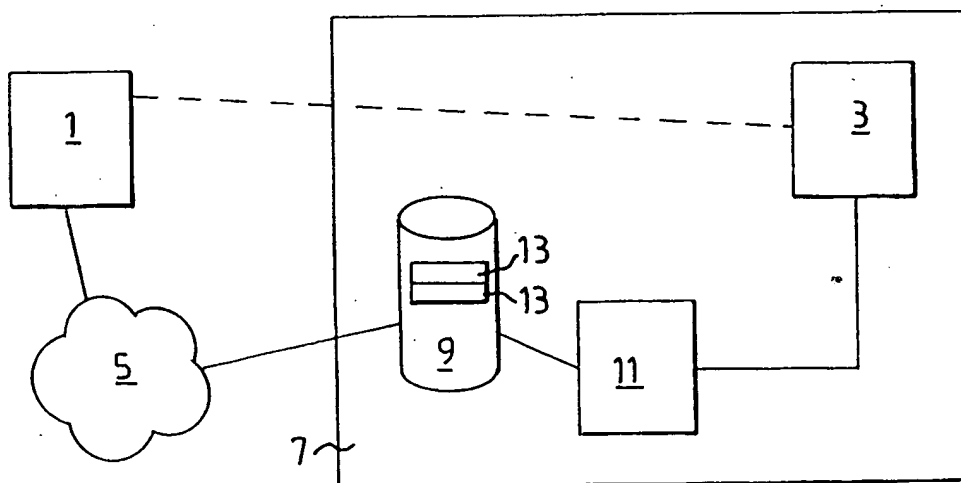
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**(57) Abstract**

The present invention relates to an apparatus and a method for use in a virtual private network, VPN, (7, 7'), or a network domain forming part of a larger network, such as the Internet, to enable a first subscriber (1; 1') in the larger network to retrieve the address of a second subscriber (3; 3') in the VPN. The address may be returned to the first subscriber (1; 1') or a connection means (11) may set up the connection between the subscribers (1, 3; 1', 3') automatically.

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METHOD AND APPARATUS TO ENABLE A FIRST SUBSCRIBER IN A LARGER NETWORK TO RETRIEVE THE ADDRESS OF A SECOND SUBSCRIBER IN A VIRTUAL PRIVATE NETWORK

Technical Field

The present invention relates to the communication between terminals connected to
5 data or multimedia networks, such as the Internet.

Background

Internet Protocol (IP) type networks are used to an increasing degree for data, video
and audio communication. It is a problem for subscribers in such networks to find
10 the physical addresses, or IP addresses, of subscribers in other networks or
subnetworks.

Summary of the Invention

It is an object of the present invention to enable a subscriber in any part of an IP
15 based network to locate other subscribers in the same or other parts of the IP based
network.

It is another object of the invention to enable subscribers in any part of an IP based
network to connect to other subscribers in the same or other parts of the IP based
20 network, for any kind of communication according to any known protocol.

It is yet another object of the invention to enable a subscriber to move between
different locations in the network and still be reached.

25 The objects are achieved in a network by using a name server means according to
the invention for each Virtual Private Network (VPN) connected to the network, the
name server means being adapted to

- resolve a logical address in the VPN to the real IP address of hosts and user
terminals for a specific service, such as e-mail or communication according to the
30 H.323 protocol,

- function as a look-up table between the logical E.164 addresses in the VPN and the real IP addresses of the hosts and users
- cooperate with connection means for call set-up.

- 5 The solution according to the invention offers the following advantages:
As it is based on known solutions, it may be implemented at a relatively low cost.
It involves the separation of an internal and an external number plan, thus increasing the flexibility in the network.
It enables the connection between an H.323 domain and an Internet domain.

10

Brief Description of the Drawings

Figure 1 is a schematic drawing of a connection between two user terminals set up according to a first embodiment of the invention.

- 15 Figure 2 is a flow chart of the actions performed when a connection between two user terminals is set up according to the first embodiment.

Figure 3 is a schematic drawing of a connection between two subscribers set up according to a second embodiment of the invention.

- Figure 4 is a flow chart of the actions performed when a connection between two
20 user terminals is set up according to the second embodiment.

Detailed Description of Embodiments

- The dotted line in Figure 1 shows a connection between a first 1 and a second 3 user terminal. The terminals 1, 3 may be any kind of terminals which may be used for
25 communication, for example personal computers (PCs) or telephones. The first user terminal 1 is connected to a data or telecommunications network 5 via a leased line, a modem a corporate network, or in any other way. The network 5 may be any network allowing communication between two end points on a logical connection, which may be packet switched or circuit switched. A common network today, in
30 which the teachings of the invention may become particularly useful, is the Internet.

In the following discussion, therefore, the network 5 will be referred to as the Internet.

The second user terminal is found in a Virtual Private Network (VPN) 7, which
5 functions as an Internet domain. A name server 9 in the VPN 7 is connected to the Internet 5 and to a connection unit 11. In TCP/IP networks the name server 9 might be a Domain Name Server (DNS) well known in the art. If the H.323 protocol for data, audio and video communication is used, the connection unit 11 might be a gatekeeper, of a kind well known in the art. The connection unit 11 is connected to
10 the second user terminal 3 with a semi-permanent connection.

The name server 9 is a database comprising, in addition to the information found in prior art name servers, an MX record 13 for each user terminal in the VPN 7. The MX record comprises information about the IP addresses of all user terminals in the
15 VPN 7 for different types of communication, for example, e-mail, H.323, or telnet connections.

Figure 2 shows the actions taken when the first user 1 in the first embodiment wishes to establish a connection to the second subscriber 3.

20

Step S11: The first user 1 connects to the name server 9 and requests the gate number for H.323 and enters the known address of the second user 3.

25

Step S12: The name server 9 determines what type of connection is wanted and forwards the request to the connection unit 11, together with the address of the first user 1.

30

Step S13: The connection unit 11 retrieves the appropriate IP address of the second user 3 for the type of connection, in this case, the H.323 address. The type of connection may be determined, for example, by the port of the name server at which the connection is made.

Step S14: The connection unit 11 establishes the connection between the users 1, 3.

5 Figure 3 shows a second embodiment of the invention. In this embodiment a first user terminal 1' is connected to a second user terminal 3' as shown by the dotted line. The second user terminal is found in a VPN 7', which also comprises a name server 9', identical to the name server 9 in Figure 1. A user directory 11' is connected to the name server 9'. The user directory 9' comprises information about
10 the physical addresses of the user terminals 3' in the VPN 7'. In a TCP/IP network, the name server will be a Domain Name Server (DNS) and the user directory will be a Lightweight Directory Access Protocol (LAPD) server of the kinds known in the art.

15 Figure 4 shows the actions taken when the first user 1' in the second embodiment wishes to establish a connection to the second subscriber 3'.

Step S21: The first user 1' connects to the name server 9' and transmits the known, logical address of the second user 3' to the name server 9'.

20

Step S22: The name server 9' determines what type of connection is wanted and forwards the logical address of the second user 3' to the user directory 11' of the VPN 7'.

25 Step S23: The user directory 11' retrieves the physical address corresponding to the logical address entered.

Step S24: The user directory 11' returns the physical address of the second user 3' to the first user 1' via the name server 9'.

30

Step S25: The first user 1' initiates the connection to the second user 3' in a conventional manner.

If the first user 1' knows the address to the user directory 11', he can go directly to
5 the user directory 11' instead of connecting via the name server 9'.

Claims

1. A name server means (9; 9') for use in a virtual private network (7; 7'), or a network domain, forming part of a compound network,
5 said means (9; 9') being characterized by means (13; 13') for receiving a request for the physical address of a user terminal (3; 3') from another user terminal (1; 1') and forwarding said request to a connection means (11; 11') in the virtual private network (7; 7') or network domain.
- 10 2. A name server means according to claim 1, characterized in that the logical addresses comprise IP addresses, addresses according to the E.164 protocol and/or other logical identities according to the appropriate numbering plan.
3. A name server means according to claim 1 or 2, characterized by means (11; 11')
15 for initiating the connection between two subscribers (1, 3).
4. A connection means (11; 11') for use in a virtual private network (7; 7') or a network domain, forming part of a compound network, said connection means being characterized in that it is adapted to return, upon a request comprising a logical
20 address of a user (3; 3') in the virtual private network (7; 7'), a physical address of said user (3; 3').
5. A connection means (11; 11') according to claim 4, characterized in that it is adapted, upon a request originating from a user (1; 1') in said compound network,
25 said request comprising a logical address of a user (3; 3') in the virtual private network (7; 7'), to establish a connection between said users (1, 3; 1' 3').
6. A telecommunications or data communications network, forming part of a compound network, characterized by at least one connection means, according to
30 claim 4 or 5.

7. A network according to claim 6, characterized by at least one name server means according to any one of claims 1-3.

5 8. A method for enabling a user (1; 1') in compound network to retrieve the IP address of a second user (3; 3') in a virtual private network (7; 7') or a network domain, forming part of said compound network,

characterized by the following steps:

- transmitting a request for a physical address, the request comprising a logical
10 address of the second user (3; 3')
- forwarding the logical address of the second user (3; 3') to a connection means (11);
- returning the logical address to the first user (1; 1') or automatically establishing a connection between the first (1; 1') and the second (3; 3') user.

15

9. A method according to claim 8, characterized by

- automatically establishing a connection between the first (1) user and the second user (3).

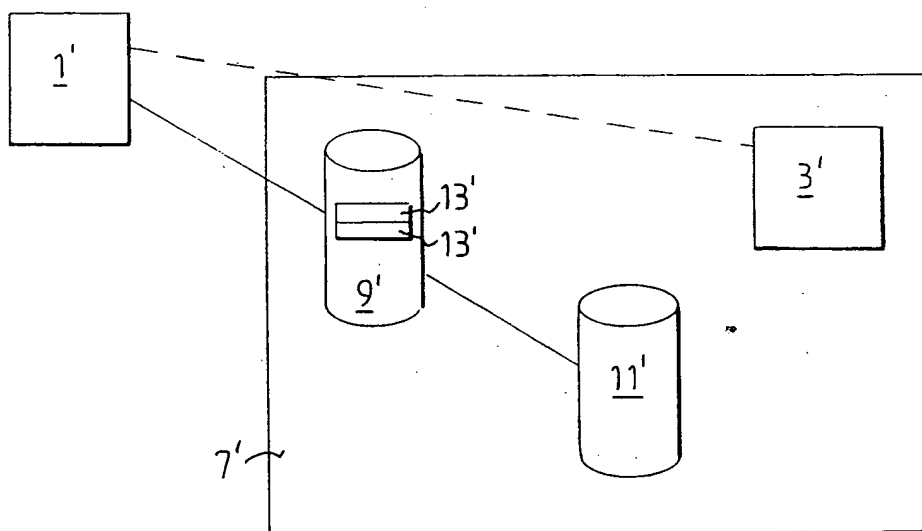
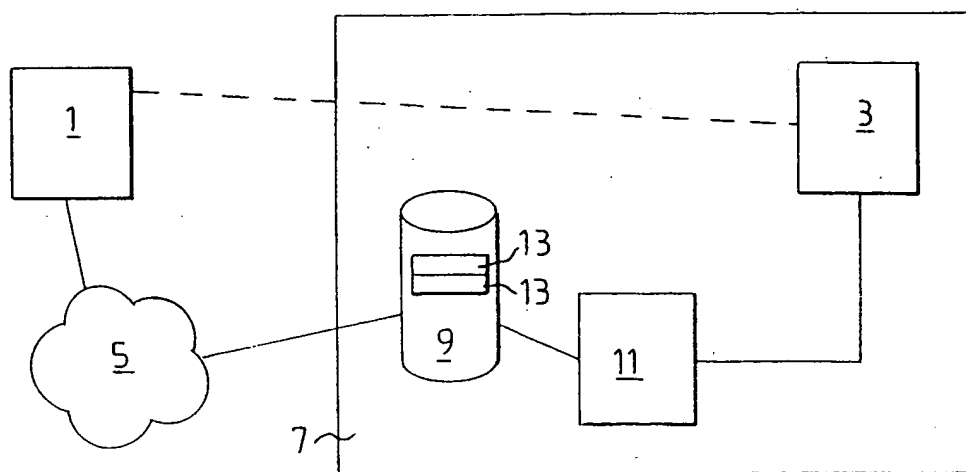
20 10. A method according to claim 8, characterized by

- returning the address of the second user (3') to the first user (1').

11. A method according to any one of claims 8-10, characterized by determining the type of address to be used in dependence of the port of the name server (9; 9') on
25 which the request was received.

12. A method according to any one of claims 6-11, characterized in that the physical address may be an e-mail-address, and/or an E.164 address.

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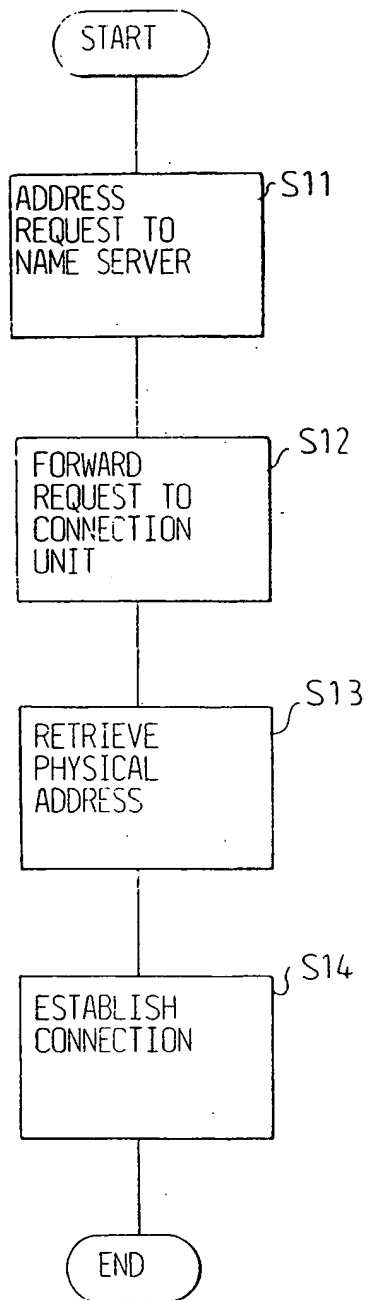


FIG. 2

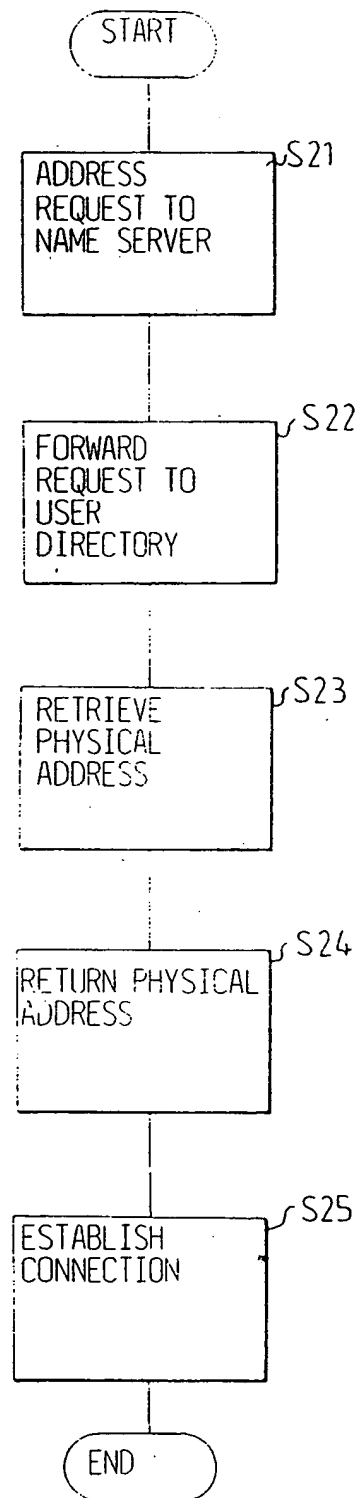


FIG. 4

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BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/01217

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04L 12/56, H04L 29/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPIL, EDOC, JAPIO

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ITU-T Recommendation H. 323, 1996, "Visual telephone systems and equipment for local area networks which provide a non- guaranteed quality of service" Paragraph 6.4, 3.41, 3.43	4-6
Y	--	1-3,7-12
Y	IETF RFC 883, Volume, November 1983, P. Mockapetris, "DOMAIN NAMES - IMPLEMENTATION and SPECIFICATION" page 23	1-3,7-12
A	IETF RFC 1383, Volume, December 1992, C. Huitema, "An Experiment in DNS Based IP Routing", paragraph 2	1-12
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "I" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search

12 January 1999

Date of mailing of the international search report

22 -01- 1999

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/01217

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	IETF RFC 2052, Volume, October 1996, A. Gulbrandsen et al, "A DNS RR for specifying the location of services (DNS SRV)", see the whole document --	1-12
A	EP 0752674 A1 (SUN MICROSYSEMS, INC.), 8 January 1997 (08.01.97), abstract -- -----	1-12

INTERNATIONAL SEARCH REPORT

Information on patent family members

01/12/98

International application No.

PCT/SE 98/01217

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0752674 A1	08/01/97	JP 9171465 A	30/06/97
		US 5745683 A	28/04/98
